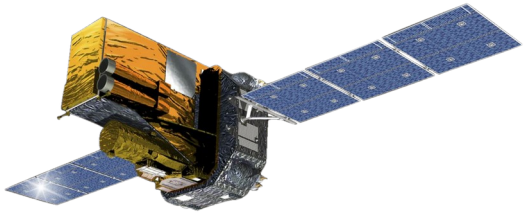
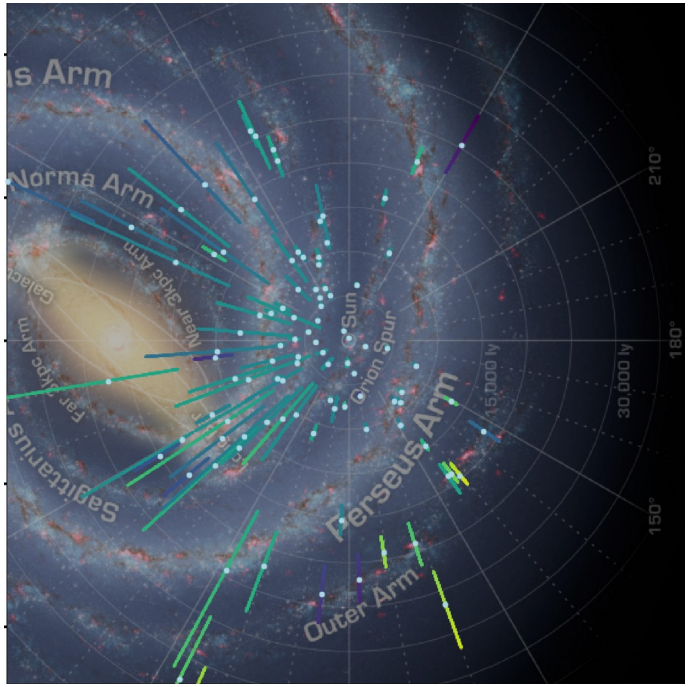
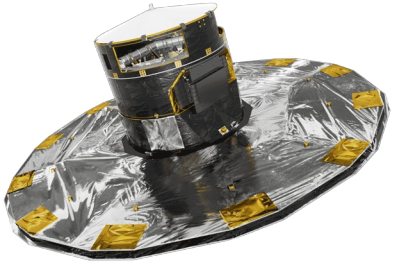
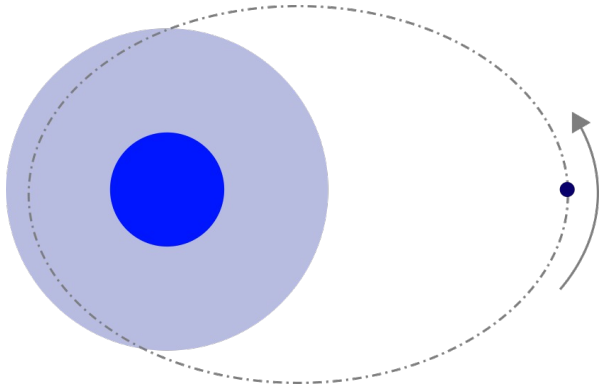
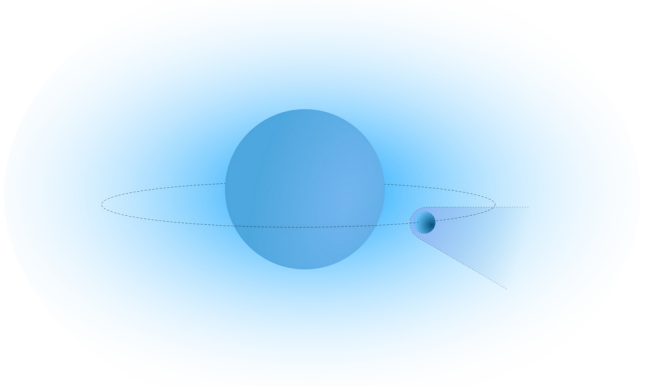
A catalogue of HMXBs in the Galaxy











Francis Fortin – Postdoc LabEx UnivEarthS – APC

X-ray binaries: observational challenges

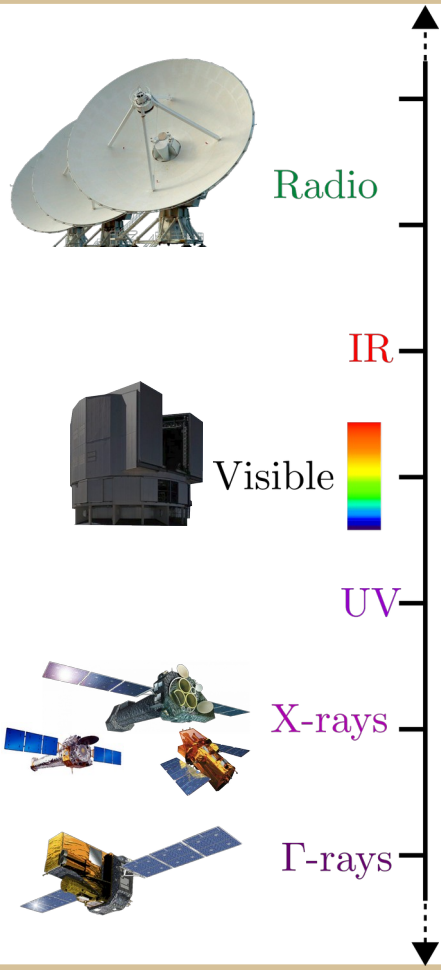
1) discovery in hard X-rays

2) better localization in soft X-rays

3) precise counterpart in optical/nIR/radio

- spectral type of the companion star ?
- (super)orbital period ?
- spin period ?
- radial velocity follow-up ?
- variability ?

→ **Many years & observations are necessary to fully constrain XRBs**



Motivations for an updated catalogue of HMXBs

Latest dedicated catalogue of HMXBs : Liu et al. 2006 (n=114, 63 confirmed and 51 candidates)

- Since then, many campaigns for the follow up of INTEGRAL sources (n=939 in Bird+2016)

+Abundance of soft X-ray observatories : Swift, XMM, Chandra, NuSTAR...

- HMXBs can have bright optical counterparts : Gaia can provide consistent distance estimates !

→ Catalogue : day-to-day work, planing new observations, studies on the scale of population

Building the catalogue

Catalogue = (Liu+2006 **x** INTEGRAL sources (2016) **x** CDS entries) **+** manual search

- Retrieve chain of counterparts from hard X-rays to nIR
- Depending on starting positional data, working up or down in the list to recover list of counterparts

→ **111 Gaia counterparts**

- manual search in the literature:

Masses, Porb, e, Ppulse, RV

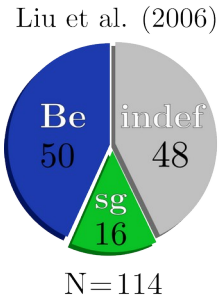
Catalogue	Reference	Radius
HEAO 1	Wood et al. (1984)	20′
Uhuru 4	Forman et al. (1978)	20′
Ariel V 3	Warwick et al. (1981)	20′
INTEGRAL	Bird et al. (2016)	20′
Fermi	Abdollahi et al. (2022)	20′
BeppoSAX	Capitanio et al. (2011)	6′
Einstein 2E	Harris et al. (1990)	4′
ROSAT	White et al. (2000)	35″
Swift 2SXPS	Evans et al. (2020)	8″
4XMM DR11	Webb et al. (2020)	4″
Chandra CSC 2	Chen et al. (2019)	3″
2MASS	Cutri et al. (2003)	120 mas
Gaia DR3	Gaia Collaboration (2022)	20 mas

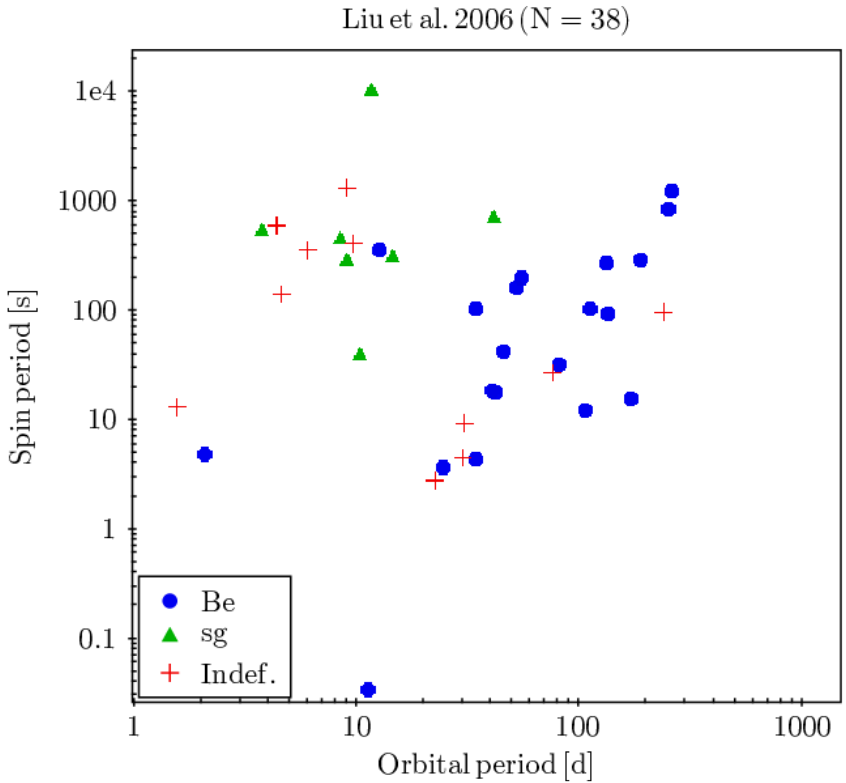
The new catalogue of HMXBs in the Galaxy

Last catalogue of HMXBs : Liu et al. 2006 [114]

→ many new observations since then

→ INTEGRAL was just beginning !





The new catalogue of HMXBs in the Galaxy

Last catalogue of HMXBs : Liu et al. 2006 [114]

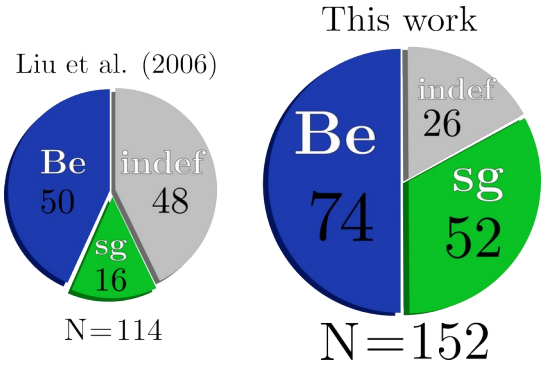
→ many new observations since then

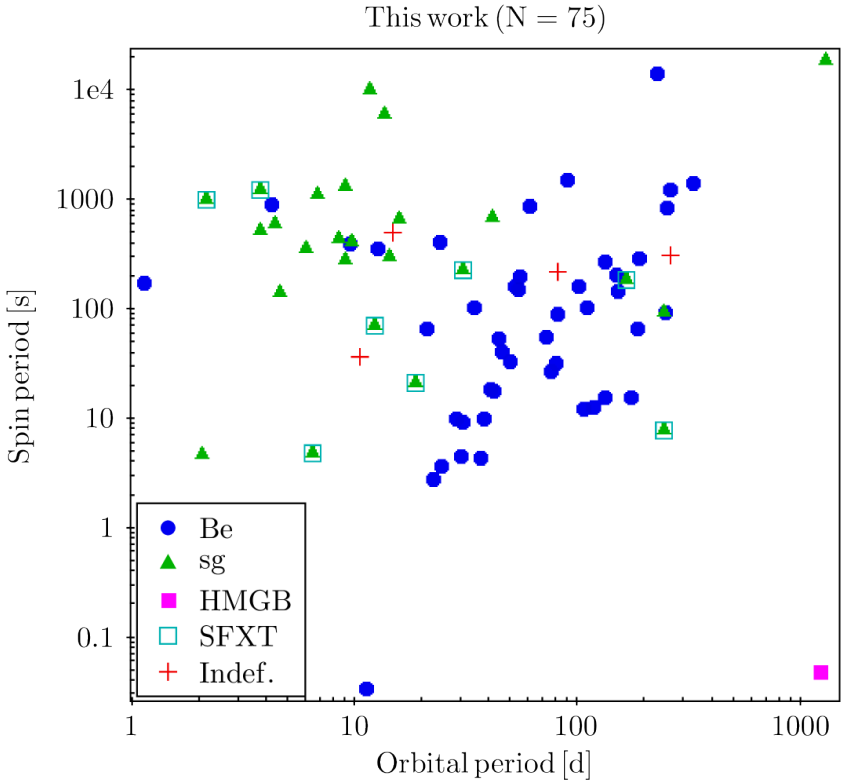
→ INTEGRAL was just beginning !

New catalogue of HMXBs : Fortin et al. 2023 [152]

→ automated search for multi-wavelength counterparts

→ manual search for spectral types, orbital parameters...

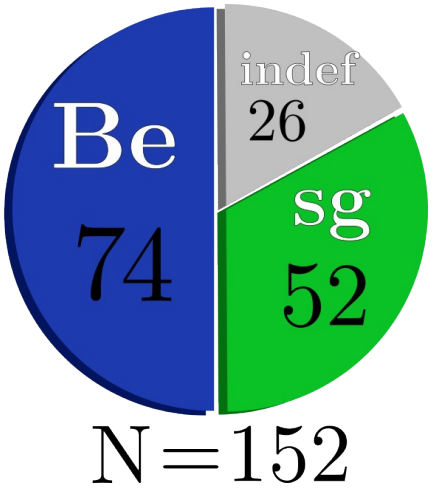




The observed HMXB population

If “confirmed” = X-ray + spectral type : **N = 126**

If “confirmed” += orbital period + spin : **N = 134**



Peculiar systems:

21 SFXT candidates Up to 7 BH HMXB candidates !

5 sgB[e] HMXBs

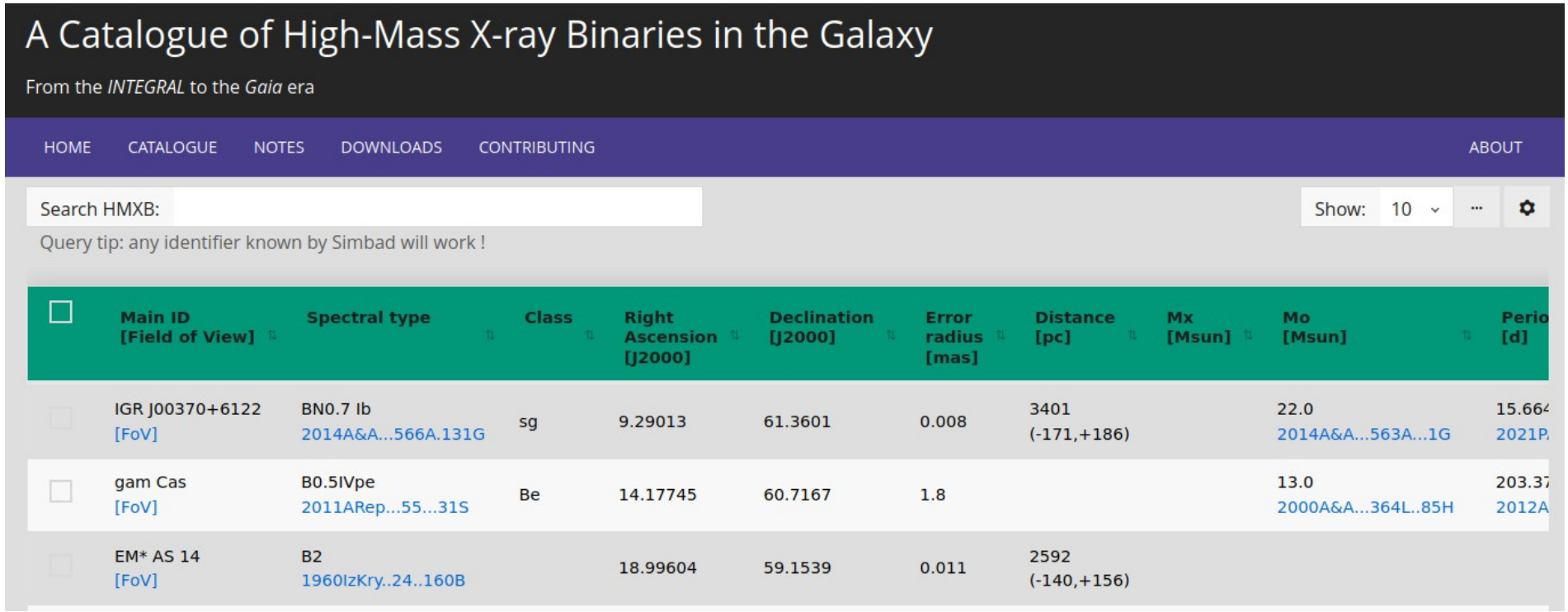
! Missing parameters !

26 spectral types 44 distances

41 orbital periods 115 radial velocities

96 eccentricities

HMXB Webcat : an online tool (live demo !)



A Catalogue of High-Mass X-ray Binaries in the Galaxy

From the *INTEGRAL* to the *Gaia* era

HOME CATALOGUE NOTES DOWNLOADS CONTRIBUTING ABOUT

Search HMXB:

Show: 10

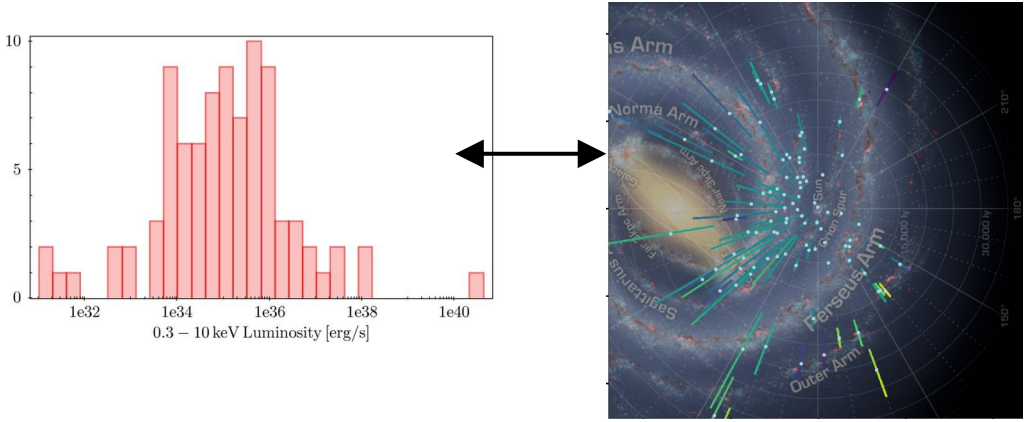
Query tip: any identifier known by Simbad will work !

Main ID [Field of View]	Spectral type	Class	Right Ascension [J2000]	Declination [J2000]	Error radius [mas]	Distance [pc]	Mx [Msun]	Mo [Msun]	Perio [d]
IGR J00370+6122 [FoV]	BN0.7 Ib 2014A&A...566A.131G	sg	9.29013	61.3601	0.008	3401 (-171,+186)		22.0 2014A&A...563A...1G	15.664 2021P.
gam Cas [FoV]	B0.5IVpe 2011ARep...55...31S	Be	14.17745	60.7167	1.8			13.0 2000A&A...364L..85H	203.37 2012A
EM* AS 14 [FoV]	B2 1960IzKry..24..160B		18.99604	59.1539	0.011	2592 (-140,+156)			

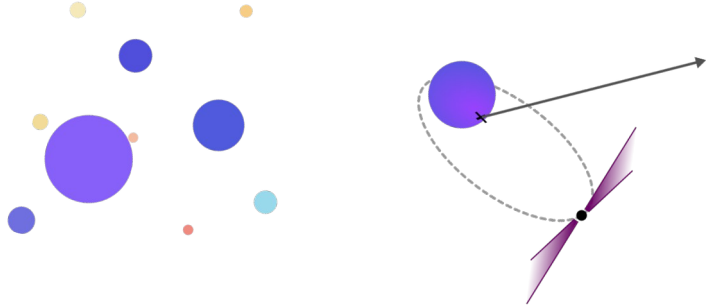
→ GitHub/HMXBwebcat

What's the use ?

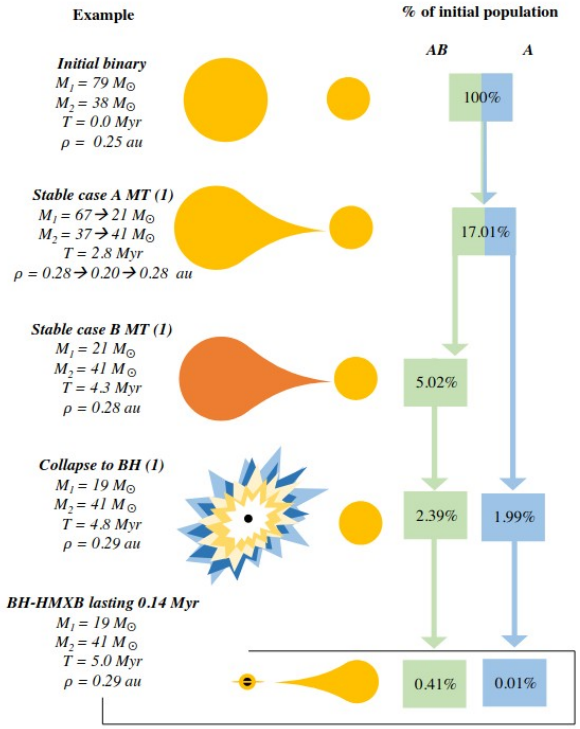
Contribution to X-ray luminosity



Evolution mechanisms



Population synthesis & compact binaries



Romero-Shaw+2023

Any contribution is welcome !

Visit the GitHub repo or reach me via email.

Modifications will be logged on the website

& new version will be available for download.

Thanks !

Attendance reward:

Long-tailed tit

Étangs de Marcoussis, FR